

Preface

Helicobacter pylori colonizes the gastric mucus layer of about half of the world's population. The bacterium was discovered in 1983 by the Australian scientists Robin Warren and Barry Marshall and designated as a gastric pathogen, causing peptic ulcer disease. In 2005, they received the Nobel Prize in Physiology or Medicine for their discoveries, primarily because the application of antibiotics to treat ulcers has changed radically the practice of medicine since that time. Colonization by *H. pylori* results in superficial gastritis without clinical symptoms in most individuals, but can progress to gastric or duodenal ulcers, gastric adenocarcinomas, and mucosa-associated lymphoid tissue-lymphomas. Disease outcome is highly complex and depends on the interplay between host, bacterial, and environmental parameters. However, irrespective of disease outcome, the majority of *H. pylori*-infected people remain colonized for their entire lifetime. Today, *H. pylori* is established as a prime example of a persistent pathogen and cancer-inducing bacterium. *H. pylori* exhibits very unique characteristics in its metabolism and survival strategies, and has been the subject of intensive research to discover the mysteries of its genetics and cellular biology. In contrast to this high importance of *H. pylori* for human health, it appears that a comprehensive volume on molecular infection mechanisms and intracellular signal transduction pathways during colonization is not fully developed.

The number of publications in the *H. pylori* field has increased substantially in recent years, making it very difficult for even the most diligent readers to stay abreast of research progress. With the breathtaking expansion of studies on *H. pylori*, this is an opportune time to review the present knowledge about this exciting research topic. Accordingly, a comprehensive collection of reviews on the multiple facets of *H. pylori* pathogenesis and signal transduction mechanisms seems both timely and appropriate for a book series. The present volume on "Molecular Pathogenesis and Signal Transduction by *H. pylori*" summarizes our current scientific understanding of *H. pylori* biology in 14 chapters by internationally recognized experts in this research field. It is designed to provide important cutting-edge findings on this fascinating microbe and molecular pathogenic processes for advanced undergraduates, graduate students, medical students,

postdoctoral fellows, clinicians, and (bio)medical investigators, who are interested in infectious diseases and host cell signaling. We discuss the most recent insights into the major signal transduction pathways and highlight their mechanism of action, in particular in response to infection with *H. pylori* and the corresponding disease pathologies.

The first chapter was designed to provide the necessary background and a general overview for understanding the topics covered in the following chapters. This introduction includes advances in the general strategies of *H. pylori* infection and specialized metabolism at the molecular level. In the subsequent chapters, we specifically discuss the current state of research concerning the regulation and action of bacterial virulence factors, genetics, and infection biology of *H. pylori*. The chapters include frontline findings and discuss the overall strategies of *H. pylori* infection, replication and persistence, cross talk with the microbiota, innovative and novel model systems and signaling mechanisms, risk factors and genetics of gastric disease and stomach cancer, as well as the impact of *H. pylori* infection on non-gastric diseases.

As will become evident from these detailed review articles, there is much more complexity in the triggered pathways than was originally anticipated, adding greatly to the overall interest in these signaling factor cascades. Within the individual chapters, readers will find not only consensus and paradigm, but also differing perspectives on the regulation and functions of the multitude of *H. pylori* factors. Importantly, all of the reviews point out specific areas, where the lack of sufficient knowledge and understanding raises intriguing new questions for further experimentation in the future. These outstanding questions often pertain to the increasingly complex biological functions of the infection and diverse mechanisms of regulation in a variety of applied systems, ranging from mouse models via gastroids to humans. Recurring themes are: (i) How the pathogen can dampen the host immune system in order to establish long-term chronic infection, (ii) what is the evolutionary benefit for *H. pylori* by hijacking distinct host signaling pathways, (iii) how many and which signal cascades are most crucial for developing gastric malignancy, (iv) what exact molecular mechanism(s) decide whether a patient remains asymptomatic or develops a given type of gastric disease and not another, and (v) can we define biomarkers for the different gastric diseases. In the future, better characterization of the cellular and molecular biology of the *H. pylori* infections will pinpoint important new therapeutic targets for the treatment and prevention of multiple infectious gastric diseases. If this comprehensive collection of reviews on *H. pylori* pathogenesis and disease-associated mechanisms stimulates fresh new thinking and research on the involved signaling pathways, this book will have accomplished its goal.

The above-discussed advances in the field have helped to shape the core of this volume. We are very grateful to all the scientific contributors from around the globe, who have participated in the preparation of these outstanding chapters

covering our growing knowledge of *H. pylori* pathogenesis and signaling. We hope that this volume will become an invaluable resource to readers new to the field and expand the resources for those professionals already working in the *H. pylori* area. We would like to thank all participants for their support and help in making this book a tremendous success.

Erlangen, Germany
November 2016

Nicole Tegtmeier
Steffen Backert

Molecular Pathogenesis and Signal Transduction by
Helicobacter pylori

Tegtmeyer, N.; Backert, S. (Eds.)

2017, XXIV, 347 p. 33 illus., 31 illus. in color., Hardcover

ISBN: 978-3-319-50519-0